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USING VIDEO MODELING TO TEACH RECIPROCAL PRETEND PLAY TO CHILDREN WITH AUTISM

REBECCA MACDONALD AND SHELLY SACRAMONE

NEW ENGLAND CENTER FOR CHILDREN
NORTHEASTERN UNIVERSITY

RENEE MANSFIELD AND KRISTINE WILTZ

NEW ENGLAND CENTER FOR CHILDREN

AND

WILLIAM H. AHEARN

NEW ENGLAND CENTER FOR CHILDREN
NORTHEASTERN UNIVERSITY

The purpose of the present study was to use video modeling to teach children with autism to engage in reciprocal pretend play with typically developing peers. Scripted play scenarios involving various verbalizations and play actions with adults as models were videotaped. Two children with autism were each paired with a typically developing child, and a multiple-probe design across three play sets was used to evaluate the effects of the video modeling procedure. Results indicated that both children with autism and the typically developing peers acquired the sequences of scripted verbalizations and play actions quickly and maintained this performance during follow-up probes. In addition, probes indicated an increase in the mean number of unscripted verbalizations as well as reciprocal verbal interactions and cooperative play. These findings are discussed as they relate to the development of reciprocal pretend-play repertoires in young children with autism.

DESCRIPTORS: autism, pretend play, video modeling

Impairments in reciprocal pretend play are well documented in children with a diagnosis of autism spectrum disorder (Jarrold, 2003; Lifter, 2000). The play of children with autism is characterized by repetitive behaviors and a lack of symbolic or social quality. Deficits in spontaneous language, imitation, and social interactions in general may be critical variables that impede the development of play. The lack of the development of reciprocal pretend play may also be due to the social consequences not being as reinforcing for children with autism relative to their typically developing peers. This insensitivity to social stimuli could directly produce deficits in social behavior (Dube, MacDonald, Holcomb, Mansfield, & Ahearn, 2004; Taylor, Hoch, Potter, Rodriguez, & Kalaigian, 2005).

A variety of behavioral teaching procedures have been examined to teach play skills to children with autism (e.g., Stahmer, Ingersoll, & Carter, 2003). Pivotal response training has been shown to be effective in establishing sociodramatic play skills with adults as play partners (Stahmer, 1995; Thorp, Stahmer, & Schreibman, 1995). In these studies, children acquired play skills, and these skills generalized across toys and adults. Pierce and Shreibman (1997) found that using peer-implemented pivotal response training resulted in increases in the social behavior between children with autism and their typically developing peers. Odom, Hoyson, Jamieson, and Strain (1985)

Address correspondence to Rebecca P. F. MacDonald, New England Center for Children, 33 Turnpike Road, Southborough, Massachusetts 01772 (e-mail: bmacdonald@necc.org).

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used peer confederates to teach social responding in the context of play and found that play with peers increased in the context of adults. Odom and Watts (1991) suggested that peer-mediated social reinforcers are necessary to maintain peer social interactions and require further study.

Modeling using play scripts also has been shown to be effective in establishing cooperative play with peers. Goldstein and Cisar (1992) used sociodramatic scripts with 3 children, 2 typically developing children and 1 child with autism, across three toys. They found that subsequent to training, all children showed increases in theme-related social behavior during play. Jahr, Eldevik, and Eikeseth (2000) compared modeling to modeling plus verbal rehearsal to teach sustained cooperative play and found the latter procedure to be more effective in establishing cooperative play, both with the training partner and across novel settings and play partners.

Video modeling is a procedure that has been used to teach a variety of skills to children with autism effectively (Charlop & Milstein, 1989; Charlop-Christy, Le, & Freeman, 2000; Haring, Kennedy, Adams, & Pitts-Conway, 1987; LeBlanc et al., 2003; Reeve, Reeve, Townsend, & Poulson, 2007; Sherer et al., 2001; Shipley-Benamou, Lutzker, & Taubman, 2002). Video modeling typically involves presenting a videotaped sample of models engaged in a specific series of scripted actions or verbalizations. The videotaped model is shown two or three times and then the individual is provided with an opportunity to perform the scripted behaviors observed on the video. Video modeling can produce more rapid acquisition and greater generalization than in vivo modeling (Charlop-Christy et al., 2000), and a number of studies have shown that prompting (other than the video) and reinforcement were not necessary for acquisition to occur (Charlop-Christy et al., 2000; D'Ateno, Mangiapanello, & Taylor, 2003; MacDonald, Clark, Garrigan, & Vangala, 2005).

Video modeling has been used to increase play statements during play with siblings (Taylor, Levin, & Jasper, 1999) and to teach children to initiate play with others (Nikopoulos & Keenan, 2003, 2004). In addition, Nikopoulos and Keenan have shown that video modeling was effective in extending length of play between adults and children with autism. D'Ateno et al. (2003) found that they could establish complex pretend-play sequences with individual children with autism. They taught children to play with three play sets (e.g., a tea set), incorporating both verbalizations and play actions using toys (e.g., drinking from a teacup). MacDonald et al. (2005) used video modeling to teach children similar pretend-play sequences, using figurines or characters in the play set that required the child to talk and act for figurines. Both of these studies found rapid acquisition of these complex sequences of play.

Video modeling has been shown to result in rapid acquisition of long chains of solitary play in children with autism without the use of response prompting and reinforcement. The purpose of the present study was to assess the effects of video modeling to teach children with autism to engage in long sequences of reciprocal pretend play with typically developing peers. The targeted play included reciprocal verbal interaction chains and cooperative play across three sets of toys.

METHOD

Participants

Two pairs of children participated in this study. Each pair consisted of a child with autism and a typically developing child. Both children with autism were enrolled in a preschool that provided early intensive behavioral intervention that offered individualized programming 5 days per week, 6 hr per day, using the principles of applied behavior analysis. A portion of the school day was spent in an on-site integrated preschool classroom that consisted of 15 typically developing children.

The first participant, Colin, was a 7-year-old boy with a diagnosis of autism. At the start of this study, he had received 27 months of intensive intervention. He communicated using full sentences but required prompting to initiate requests. He demonstrated two-step imitation and picture-to-object matching. Video modeling had been used to teach Colin solitary play, across six play activities, during the year prior to the study. Prior exposure to video modeling did not include the videos used in the current study. Colin was integrated into a local kindergarten classroom 5 mornings a week with the support of a therapist and performed at the kindergarten grade level on academic skills. He spent his afternoons in the specialized preschool program. Colin's partner, Helen, was a 5-year-old typically developing girl who was enrolled in the integrated preschool classroom.

The second participant, Alden, was a 5-year-old boy who also had a diagnosis of autism. He had received 16 months of intensive intervention when he began the study. He had developed a repertoire of play skills with a number of toys, but his play was solitary. He communicated using full sentences, which he used to describe events in his environment and to make requests. He had well-developing imitation and matching skills. Video modeling also had been used with Alden to teach solitary play, both in the classroom and at home with his mother. He had learned to play successfully with over a dozen toys using video modeling. Prior exposure to video modeling did not include the videos used in the current study. Alden was integrated into a preschool classroom for 1 hr a day, with the support of a therapist. His partner, Gerry, was a 5-year-old typically developing boy who was enrolled in the integrated classroom.

Both typically developing peers were selected to participate as peer tutors because they demonstrated many of the peer-selection criteria mentioned by Taylor (2001). They were cooperative in following adult instructions, assertive in play sessions, socially competent, and capable of keeping an interest in activities. Both peers had been taught previously to serve as peer tutors for children with autism (but not those in this study). Peer tutoring occurred informally across the school year and included prompts from teachers to share materials or to offer play directives. They had no prior experience with video modeling.

Setting

Baseline and video modeling sessions were conducted in a small testing room to control for variables such as noise and visual distracters present in the child's classroom. The room contained two child-sized tables, two child-sized chairs, and one toy shelf with various toys on it. The materials necessary for the play activity being trained were placed in an open area on the floor. The video model was presented on a television with a VCR, which was placed on a table. One session per participant was conducted daily. All sessions were videotaped for later scoring. The video camera was held by the experimenter at a distance of approximately 1.5 m from the children.

Materials

Three play sets were used to teach reciprocal pretend play. The play sets included a Fisher-Price Little People airport, a Fisher-Price Little People Animal Sounds zoo, and a Playskool grill. Scripts were developed for each play set. Each play set had a base structure (airport, zoo, or grill) and seven characters or objects pertaining to the theme of the structure that were used in the video modeling scripts. All three play sets were capable of making sounds and movements; however, these features were disabled in the present study.

The airport base structure had an airport terminal with a snack bar and an attached runway with a place to get gas and park the airplane. The characters included a boy passenger and a pilot. The additional objects included a taxi, a transport vehicle, a suitcase, an

umbrella, and an airplane. The zoo base was the animal house. The characters included a boy, a zookeeper, and three animals (a bird, a polar bear, and a lion). The objects included a truck and a bucket of fish. The grill consisted of a toy gas grill with a lid and places for utensils. It also had knobs used to start and adjust the heat on the grill. The additional objects included a bottle of ketchup, a spatula, a fork, a cheeseburger, a hot dog and bun, and two paper plates.

Videos

Two adults were videotaped acting out the sequence of pretend play. Prior research has shown that adults are easy to train and very effective as models to teach play to children (MacDonald et al., 2005). Two male models were used for the pair of male children (Alden and Gerry), and the models for the boy-and-girl pair (Colin and Helen) were a male and a female. The models were matched for gender because we believed this would increase the likelihood of imitation.

Each video was related to a designated play activity and contained 14 to 17 scripted verbalizations and 14 to 17 actions associated with the play activities. These scripts were based on observations of typically developing children playing with these toys. Typical peers were videotaped playing with toys and an observer transcribed their verbalizations and actions. Samples from these transcripts were used to create the scripts for each toy. (Copies of the complete scripts can be obtained from the first author.) Scripts were recorded on a VHS-C camcorder and shown on a portable TV with a 13-in. screen and a VCR player. The TV/VCR was placed on a table separate from the area in which the children played with the toy set.

Airport and zoo. Adults on the video manipulated the characters, spoke for the characters, and manipulated the materials through the characters (doll as agent; Lifter, 2000). For example, in the airport script the typically developing child's character says ''First we need gas'' and puts the nozzle in the gas tank of the plane, then the child with autism's character says ''I'll get my suitcase'' and puts the suitcase in the compartment under the plane. In the zoo script, the typically developing child's character says ''Can I feed him?'' in the presence of the polar bear, and the child with autism's character says ''Sure, he loves fish.'' Then the typically developing child's character throws fish into the polar bear's den.

Grill. Adults on the video manipulated the materials and spoke to each other (child as agent; Lifter, 2000). For example, the child with autism says ''Let's check our food,'' and the typically developing child opens the grill lid and says ''I think it's ready.'' They both use utensils to take food off the grill.

Independent Variable

The presentation of video models that depicted scripted play interactions for the three sets of play materials was the independent variable. No reinforcement or prompting was provided to the participants with autism.

Dependent Measures

All sessions were videotaped and scored later for the occurrence of the following responses: (a) scripted verbalizations, (b) scripted play actions, (c) unscripted verbalizations, (d) unscripted play actions, (e) cooperative play, and (f) reciprocal verbal interaction chains.

Data were scored from videotapes of all of the 4-min play sessions (baseline, training, and probes). Data for scripted behaviors were recorded for each child on his or her part of the script. For example, in the airport script the child with autism took the role of the passenger, and the typically developing child took the role of the pilot. Data were recorded on the number of scripted actions and verbalizations only for their assigned character. The number of scripted actions and verbalizations ranged from 14 to 17 for each child, depending on the script. A separate coding system was developed to score unscripted behaviors. Unscripted behaviors

were measured during baseline and probe sessions only to assess changes in unscripted play as a result of video modeling.

To assess cooperative play and reciprocal verbal interaction chains, samples of these behaviors were scored from videotaped sessions. These behaviors were measured during the first 90 s of the two initial baseline sessions and two mastery probe sessions. A real-time measurement method (Miltenberger, Rapp, & Long, 1999), which required second-by-second recording, was used to assess percentage of intervals of cooperative play and duration (number of seconds) of reciprocal verbal interaction chains. Mean duration of reciprocal chains was calculated by adding the number of consecutive seconds (during each interaction chain) in which each child was talking to the other and dividing by the total number of reciprocal verbal interaction chains.

Scripted verbalizations. Scripted verbalizations were defined as vocal statements that matched the statement of the video model. In addition, statements that were similar to the modeled response but not identical also were scored. This included the substitution or omission of a word. Repetitions of prior verbalizations used in the same session were not scored as scripted. The number of scripted verbalizations ranged between 14 to 17, depending on the script. Each child was scored on the occurrence of scripted verbalizations for his or her own portion of the script.

Scripted play actions. Scripted actions were defined as motor responses that matched the actions of the video model and resulted in the same change in the environment as seen in the model. If the child engaged in the complete scripted sequence, a play action was scored. For example, getting into the airplane was scored only if the character was put in the airplane and left there, or feeding fish to the bear at the zoo was counted only if the character was used to throw the fish to the bear. The number of scripted actions ranged between 14 and 17, depending on the script. Each child was scored on the occurrence of scripted play actions for his or her own portion of the script.

Unscripted verbalizations. Novel unscripted verbalizations included verbalizations that were not modeled in the video script but were appropriate to the context of the toy (e.g., talking about arriving at grandma's house in the airport script or talking for animals that do not talk in the script). These behaviors were scored using a data sheet that had a variety of possible types of vocalizations that were not part of the script as well as a column for recording other unscripted vocalizations that the child emitted but that were not listed on the data sheet. For example, in the airport play set the script ended with the plane flying away, but if the child continued to play with the plane by landing it and said "Here we are at grandma's house," this was scored as an unscripted verbalization. Unscripted verbalizations were scored only during baseline and mastery probe sessions because the goal was to assess changes in unscripted play as a result of the video modeling.

Unscripted play actions. Novel unscripted play included a play action that was not modeled in the video script but that was appropriate to the context of the toy. For example, again using the airplane play set, landing the plane and getting out of the plane were scored as unscripted actions. These behaviors were again scored using a data sheet similar to the one described for unscripted verbalizations.

Cooperative play. The percentage of intervals of cooperative play were measured during baseline and mastery probes. Cooperative play was defined as the child being within 0.33 m of the peer and engaged in the same activity in interdependent or shared play. Interdependent play included handing materials to the peer (e.g., giving the peer ketchup when preparing food that was cooked on the grill or having the characters ride in the same vehicle). It also included participating in the same activity and

talking about the same scripted or unscripted topic (e.g., each child cooking a different food on the same grill and talking about what they were cooking).

Reciprocal verbal interaction chain. The duration of reciprocal verbal interaction chains was measured during baseline and mastery probes. The chain was defined as a sequence of two or more verbalizations between a participant and peer. A chain began when 1 child responded with a contextually appropriate verbalization to the other child's statement or request and ended when no verbalizations occurred for 2 s. An example of a verbal interaction chain was 1 child saying, ''May I have the ketchup?'' and the peer responding by saying ''sure,'' and the 1st child then saying ''Thanks, this hamburger is good.'' These interaction chains included scripted and unscripted verbalizations.

Experimental Design

A multiple-probe design across play sets was used to assess the effects of the video modeling intervention on reciprocal pretend play. The play sets were taught in the same order for each pair of children starting with the airport, then the zoo, and finally the grill. Both children in each pair were required to perform at or above mastery levels on scripted verbalizations and scripted play actions before training could begin on the next play set. Baseline sessions were conducted prior to the introduction of training for each play set, and mastery probes were conducted subsequent to acquisition of each new play set.

Procedure

Baseline. During baseline sessions, the play sets were arranged on the floor prior to the pair of children entering the room. For the airport and zoo play sets, the characters were positioned to the left and right of the play area. When the children arrived, they were prompted to sit on the floor in front of the play set. The child with autism was always directed to sit on the left and the typical peer to sit on the right, because these positions coincided with the positions of the characters they would be assuming during video modeling training. Once the children were seated, the experimenter gave the instruction ''It's time to play.'' The children were allowed 4 min to play with the toys. An adult stood just behind the children and did not give any additional instructions or physical cues to ensure that the toy rather than the adult controlled reciprocal play, while the experimenter video taped each session. If a child spoke to the experimenter or tried to leave the area before the end of 4 min, the experimenter said ''Play with your toys'' and directed the child back to the play set.

Video viewing. During video viewing sessions, the materials were set up in the same manner as baseline, and a TV/VCR was set up on a table in the corner of the room with two chairs in front of it. The children entered the room and were directed to sit in the chairs to watch the video; again the child with autism was seated on the left and the typically developing child was seated on the right. The airport and zoo scripted roles were determined by the specific character each child was assigned to play with, and the children were positioned in front of those characters in the context of both the video and play set. The position of the child alone defined his or her role for the grill script. They watched the video model twice and then were directed immediately to the play materials and told ''It's time to play.'' As in baseline, the children were allowed 4 min to play with the toys while the adult stood behind them. No prompts or reinforcement was delivered during these sessions. Video viewing sessions continued until the child with autism demonstrated mastery level performance on all actions and verbalizations for his portion of the cooperative play script. Mastery level was defined as accuracy on 13 of the 15 actions and 12 of the 14 verbalizations for the airport, 12 of the 14 actions and 13 of the 17 verbalizations for the zoo, and 13 out of the 16 actions and 12 of the 14 verbalizations for the grill.

Additional coaching for typical peers. Because both typical peers did not initiate the script viewed on the video, additional coaching was needed. Coaching was provided to Helen prior to Sessions 3 and 4 for the airport script, and for Gerry coaching was provided prior to Session 5 for the airport and Session 4 for the grill. The experimenter encouraged them to say and do everything the model said and did in the video for their character or role. They also were encouraged to "talk a lot." No additional prompting was given during the training or probe sessions.

Mastery probes. Once mastery criteria were met in the context of video modeling teaching sessions, mastery probes were conducted without the video. During these probes, the children were presented with the toy set, instructed to sit to the left or right of the materials, and given the instruction to play. If the child with autism demonstrated an accuracy level of 13 of the 15 actions and 12 of the 14 verbalizations for the airport, 12 of the 14 actions and 13 of the 17 verbalizations for the zoo, and 13 of the 16 actions and 12 of the 14 verbalizations for the grill for two consecutive sessions without the video model, they met mastery criteria for the play set and training could begin on a new play set.

Follow-up probes. Follow-up probes were conducted to determine maintenance over time without access to the toys or videos. These probes were introduced approximately 1 month following mastery of the airport and zoo. Three follow-up probes were conducted on the airport. They were assessed after the zoo was mastered and then again after the grill was mastered. Follow-up probes (one for Colin and Helen, two for Alden and Gerry) were conducted on the zoo after the grill was mastered. These probe sessions were identical to baseline and mastery probe sessions.

Interobserver Agreement

Interobserver agreement was calculated in 45% of sessions for scripted verbalizations and actions. Interobserver agreement for play actions was 95% for the airport, 95% for the zoo, and 92% for the grill. Agreement for verbalizations was 96% for the airport, 96% for the zoo, and 96% for the grill. Agreement data for unscripted behaviors were collected in 33% of the sessions. Agreements for unscripted play actions were scored if both observers recorded the same play action, and disagreements were scored if the observers recorded different play actions. The same procedures were used to score agreements and disagreements for unscripted verbalizations. Agreement for unscripted play actions was 100% for the airport, 91% for the zoo, and 91% for the grill. Agreement for unscripted verbalizations was 96% for the airport, 100% for the zoo, and 98% for the grill. Agreement data for cooperative play and reciprocal verbal interaction chains were collected in 83% of the sessions. Agreements were scored if both observers scored the occurrence or nonoccurrence of cooperative play and verbal interaction chains within each 1-s observation interval. Interobserver agreement was calculated by dividing the number of intervals of agreements by the number of intervals of agreements plus disagreements, and this ratio was converted to a percentage. Agreement for cooperative play was 95%, and agreement for reciprocal verbal interaction chains was 95% across play sets.

RESULTS

Scripted behaviors for the first pair of children are shown in the left (Colin) and right (Helen) panels of Figure 1. Colin exhibited low levels of scripted verbalizations ($M = 0.33$ per session; range, 0 to 1) and scripted actions ($M = 4.67$ per session; range, 4 to 5) during baseline for the airport; these increased to 14 verbalizations (of 14) and 13.5 actions (range, 13 to 14) per session on mastery probes. He exhibited low levels of scripted verbalizations ($M = 0$) and scripted actions ($M = 0.8$ per session; range, 0 to 2) during baseline for the zoo; these increased to 16 verbalizations (of 17)

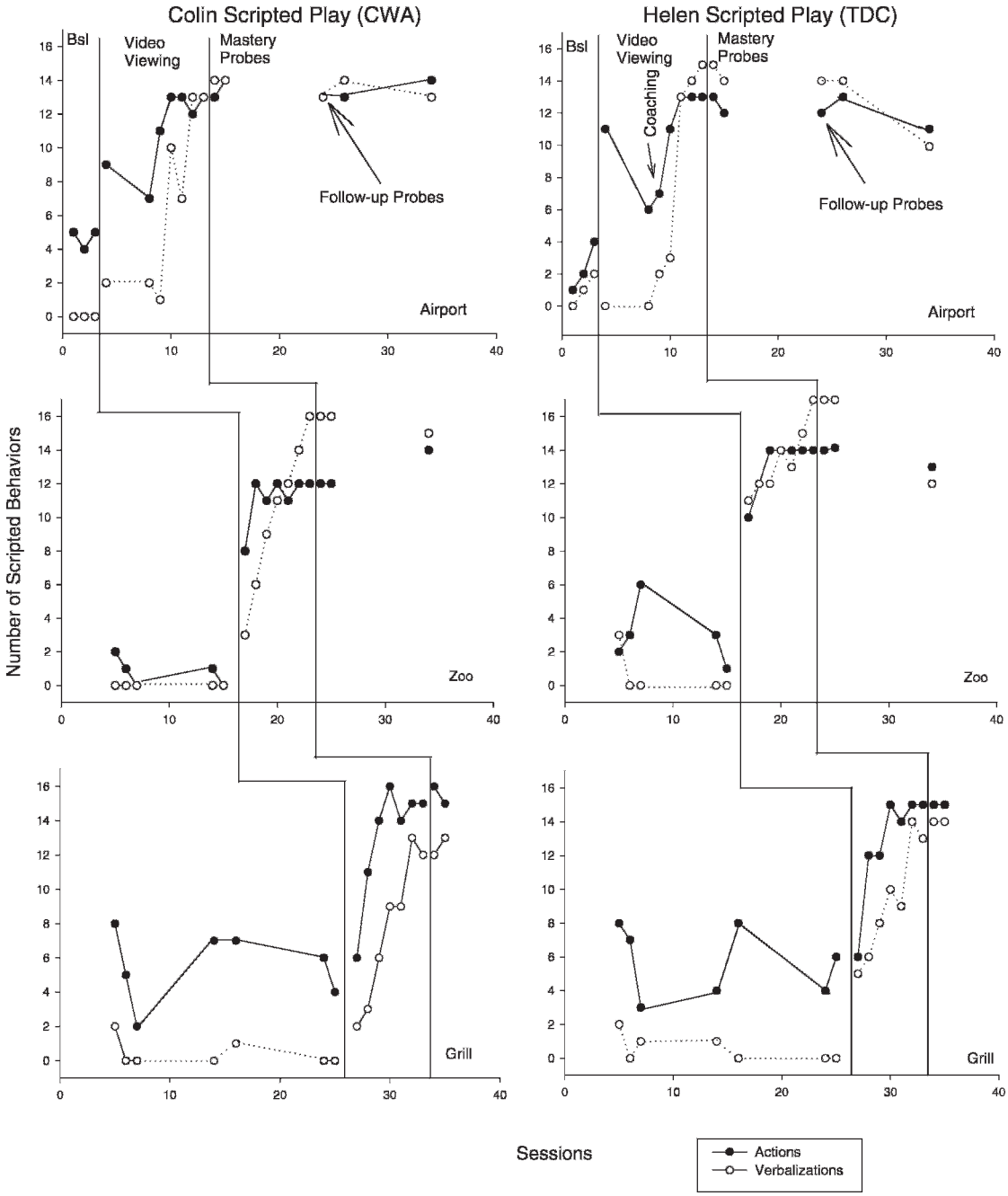

Figure 1. Number of scripted verbalizations and scripted actions demonstrated by Colin and Helen with the airport, zoo, and grill.

and 12 actions (of 14) per session on mastery probes. He exhibited low levels of scripted verbalizations (M = 0.43 per session; range, 0 to 2) and scripted actions (M = 5.67 per session; range, 2 to 8) during baseline for the grill; these increased to 12.5 verbalizations (of 14) and 15.5 actions (range, 15 to 16) per session on mastery probes. Helen showed

similar increases in scripted verbalizations and actions subsequent to video modeling training.

Scripted behaviors for the second pair of children are shown in the left (Alden) and right (Gerry) panels of Figure 2. Alden exhibited low levels of scripted verbalizations ($M = 0$) and scripted actions ($M = 3.5$ per session; range, 3 to 4) during baseline for the airport; these increased to 12 verbalizations (range, 10 to 14) and 13.6 actions (range, 13 to 15) per session on mastery probes. He exhibited low levels of scripted verbalizations ($M = 0.4$ per session; range, 0 to 1) and scripted actions ($M = 2.4$ per session; range, 1 to 4) during baseline for the zoo; these increased to 16 verbalizations (range, 15 to 17) and 13.5 actions (range, 13 to 14) per session on mastery probes. He exhibited low levels of scripted verbalizations ($M = 0.33$ per session; range, 0 to 1) and scripted actions ($M = 3.5$ per session; range, 1 to 5) during baseline for the grill; these increased to 9.5 verbalizations (range, 8 to 11) and 13.3 actions (range, 12 to 15) per session on mastery probes. Gerry showed similar increases in scripted verbalizations and actions.

Across play sets Colin exhibited a mean of 1.5 (grill), 2.5 (zoo), and 3.5 (airport) unscripted verbalizations and a mean of 2 to 3 unscripted actions (data not shown). After video modeling, he showed a mean of 2.5 (grill) and 4 (airport and zoo) unscripted verbalizations and a mean of 1 to 3 unscripted actions across play sets. During baseline, Alden exhibited few verbalizations across play sets. He exhibited a mean of 1 to 2.5 unscripted actions across play sets. After video modeling, he showed increases in unscripted verbalizations to a mean of 7.5 (zoo) and 5.5 (grill). His play actions were primarily scripted during mastery probes.

Cooperative play (data not shown) for Colin occurred in 17%, 0.06%, and 15% of intervals during baseline for the airport, zoo, and grill, respectively, and increased to 87%, 85%, and 90% of intervals on mastery probes for the airport, zoo, and grill, respectively. Cooperative play for Alden occurred in 6%, 0.5%, and 3.5% of intervals during baseline for the airport, zoo, and grill, respectively, and increased to 78%, 74.5%, and 67% of intervals on mastery probes for the airport, zoo, and grill, respectively.

The mean numbers of reciprocal verbal interaction chains (data not shown) for Colin during baseline were 0 for the airport and zoo and 0.5 for the grill; these increased to a mean of 5 for the airport and 6 for the zoo and grill on mastery probes. The mean durations of reciprocal verbal interaction chains for Colin in baseline were 0 s for the airport and zoo and 1.5 s for the grill; these increased to a mean of 7.5 s, 10 s, and 7 s for the airport, zoo, and grill, respectively, on mastery probes. The mean number of reciprocal verbal interaction chains for Alden during baseline was 0 for all three play sets; these increased to a mean of 3, 7, and 4.3 for the airport, zoo, and grill, respectively, on mastery probes. The mean durations of reciprocal verbal interaction chains for Alden in baseline was 0 s for all three play sets; these increased to 20 s, 8.5 s, and 8.75 s on mastery probes for the grill.

DISCUSSION

In this study, video modeling produced extended sequences of reciprocal pretend play between children with autism and typically developing peers across three commercially available play sets. Prior to video instruction there was little appropriate play between the children. This is particularly interesting because the typical children had extensive play skills in their classroom with other typical children. They engaged in pretend play with a variety of toys and used language in their play, but in the presence of children with autism, these behaviors were not evident. Both pairs of children exhibited rapid acquisition of verbalizations and play actions, and this performance was maintained over time. These acquired chains of play included up to 17 actions with verbalizations

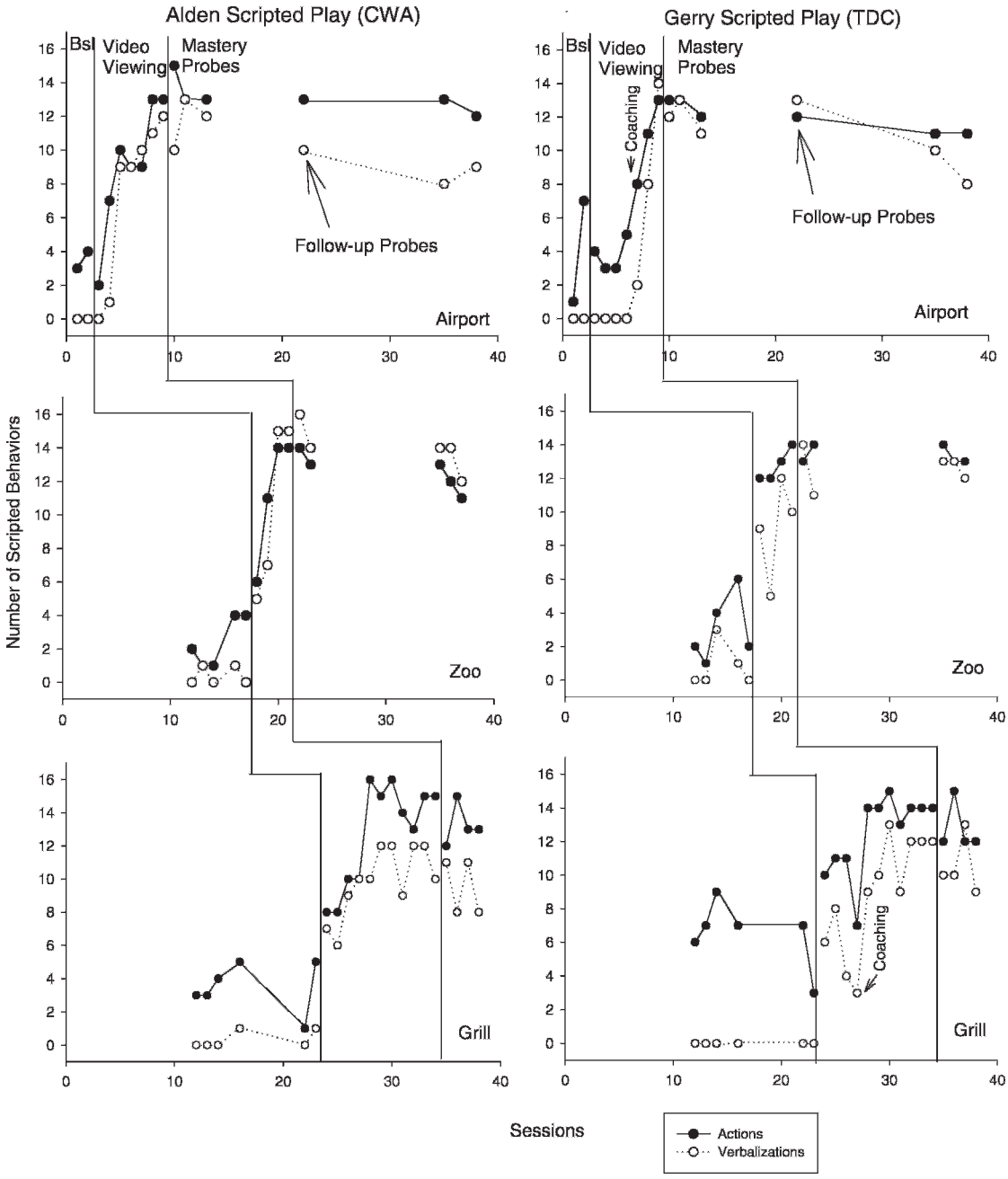

Figure 2. Number of scripted verbalizations and scripted actions demonstrated by Alden and Gerry with the airport, zoo, and grill.

embedded into the play scenarios. In addition, these play chains were acquired without the use of response prompting other than the video, and there was no experimenter-delivered reinforcement.

An analysis of unscripted play revealed slight differences between children. Although Colin primarily acquired the scripted behaviors and relatively few unscripted behaviors, Alden showed increases in unscripted verbalizations

with two of the toys following training. This could have occurred because Alden had a more extensive history of learning pretend play using video modeling both at home and at school. In general, the children engaged in more novel verbalizations than actions across scripts. The emergence of any unscripted play, whether verbalization or action, was encouraging because children with autism tend to have very limited repertoires of play; thus, increasing play in any manner is significant. Acquiring play skills may also make it more likely that natural social consequences for interaction will come to exert an influence on the behavior of the children with autism. That is, social consequences that were ineffective may come to have some value for these children through this training.

Qualitative changes in play, as measured by cooperative and reciprocal verbal interaction chains, were particularly interesting. They indicate that the children did not exhibit cooperative play prior to the video modeling procedure. Following the introduction of video modeling, the children engaged in cooperative play throughout the play sessions. In addition, the children were engaged in reciprocal verbal interactions either by talking for the characters or speaking for themselves (as in the activity involving the grill). This increase in verbal interactions and cooperative play was achieved without prompting (other than the video) and without extrinsic reinforcement. It may be that the typically developing child's scripted verbalizations and play actions served as discriminative stimuli, thereby occasioning the response of the child with autism. Nonetheless, these social interactions potentially set the occasion for the child with autism to contact the natural community of social reinforcers (Baer & Wolf, 1970).

Determining the operant mechanism that produced the observed change in behavior in this study was not the purpose of this research. Although video modeling is often referred to as a procedure that does not require explicit prompting or extrinsic reinforcement (e.g., Charlop-Christy, Le, & Daneshvar, 2003; Taylor et al., 1999), it must be noted that the presentation of the video itself is an explicit prompt. Children with autism often do not learn typical play skills through the social situations they encounter in the natural environment. One possible reason for the effectiveness of video modeling is that it provides a discrete opportunity to observe play without the many distractions often present in the natural environment. Those children who readily imitate observed actions can acquire a repertoire presented on a videotape when provided the materials and an opportunity to play. This may be most likely to occur in children with a history of being taught to imitate the actions of others. Moreover, if imitation has been regularly reinforced, this history of reinforcement may foster generalization to the videotaped skill (see Nikopoulos & Keenan, 2007). Thus, video modeling can be an effective prompting strategy that capitalizes on a history of extrinsic reinforcement for imitating others, with little reliance on physical prompting.

A limitation of this study was the lack of extended novel play. However, the increase in cooperative play was significant. These children did not engage in any cooperative play prior to video modeling and, subsequent to training, engaged in high levels of cooperative play that included verbal reciprocal interactions. Another limitation of the study was the lack of generalization to other natural play settings and different play materials using the same themes. An additional limitation was the potential that the presence of an adult behind the child could have established stimulus control and therefore exerted some level of control over responding. Lastly, future research should address the issue of generalization of these newly acquired play repertoires to novel settings, peers, and play materials.

In this study, video modeling was an effective and efficient strategy for teaching sequences of

cooperative play. Given the opportunity to observe videos of social interactions in the context of play, these children engaged in reciprocal play interactions with typically developing peers. This represents an important qualitative change in their play behavior. It is promising that these interactive play skills were achieved with relatively short exposure to training and in the absence of response prompting and reinforcement.

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